CLAIMS

1. A process for the in vitro determination of peptides corresponding to immunologically important epitopes comprising the steps of:

(a) preparing peptides corresponding to portions of the amino acid sequence of the protein or polypeptide to be analysed wherein said peptides are either contiguous or preferably overlapping by at least 3 amino acids;

(b) biotinylation of said peptides;

(c) binding said biotinylated peptides to a solid phase by interaction of the biotylated group and streptavidin or avidin; and

(d) measuring antibodies which bind to the individual peptides.

2. The process according to Claim 1 wherein said a.a. overlap by about 6 to about 12 amino acids.

3. A composition of matter which can be represented as follows:

$$(A)-(B)-(X)-Y-[\text{amino acids}]_n-Y-(X)-Z$$

where

- $[\text{amino acids}]_n$ is meant to designate the length of the peptide chain where n is the number of residues, being an integer from about 4 to about 50, preferably less than about 35, more preferably less than about 30, and advantageously from about 4 to abut 25;

- B represents biotin,

- X represents a biotinylation compound which is incorporated during the synthetic process,

- Y represents a covalent bond or one or more chemical entities which singly or together form a linker arm separating the amino acids of the peptide proper from the biotinyl moiety B or X, the function of which is to minimize steric hindrance which may interfere with the binding of the biotinyl moiety B or X to avidin or streptavidin, wherein Y is not a covalent bond, it is advantageouly at least one chemical entity and may consist of as many as 30 chemical entities but will consist most frequently of 1 to 10 chemical entities, which may be identical or different, more preferably glycine residues, β-alanine, 4-aminobutyric acid, 5-aminovaleric acid, or 6-aminohexanoic acid,

- B and X being enclosed in parentheses to indicate that the presence of biotin or biotinylated compound in these positions is optional, the only stipulation being that B or X be present in at least one of the positions shown,

- A, when present, as indicated by parentheses, represents (an amino acid(s), an amino group, or a chemical modification of the amino terminus of the peptide chain;

- Z represents (an) amino acid(s), an OH-group, an NH_2-group or a linkage involving either of these two groups, wherein the amino acids are selectively chosen to be immunodominant epitopes which are recognized by a large percentage of true positive sera or are able to complement other antigens in the test to increase the detection rate and B interacts with the selected amino acids to produce a compound with greater diagnostic sensitivity.

4. Peptide composition comprising at least one peptide having an amino acid sequence selected from the group consisting of :

(A)-(B)-(X)-Y-Ile-Trp-Gly-Cys-Ser-Gly-Lys-Ile-Cys-Y-(X)-Z (1a.1)

(A)-(B)-X)-Y-Ile-Trp-Gly-Cys-Ser-Gly-Lys-Leu-Ile-Cys-Thr-Thr-Ala-Val-Pro-Trp-Asn-Ala-Ser-Y-(X)-Z (1a.2)

(A)-(B)-(X)-Y-Glu-Arg-Tyr-Leu-Lys-Asp-Gln-Gln-Leu-Leu-Gly-Ile-Trp-Gly-Cys-Ser-Gly-Lys-Leu-Ile-Y-(X)-Z (1a.3)

(A)-(B)-(X)-Y-Leu-Gln-Ala-Arg-Ile-Leu-Ala-Val-Glu-Arg-Tyr-Leu-Lys-Asp-Gln-Gln-Leu-Y-(X)-Z (1a.4)

(A)-(B)-(X)-Y-Leu-Trp-Gly-Cys-Lys-Gly-Lys-Leu-Val-Cys-Y-(X)-Z (1a.5)

(A)-(B)-(X)-Y-Asp-Gln-Gln-Leu-Leu-Gly-Ile-Trp-Gly-Cys-Ser-Gly-Lys-His-Ile-Cys-Thr-Thr-Asn-Val-Pro-Trp-Asn-Y-(X)-Z (1a.6)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Lys-Ser-Ile-His-Ile-Gly-Pro-Gly-Arg-Ala-Phe-Tyr-Thr-Thr-Gly-Glu-Ile-Ile-Gly-Y-(X)-Z (1b.1)

(A)-(B)-(X)-Y-Cys-Thr-Arg-Pro-Asn-Asn-Asn-Thr-Arg-Lys-Ser-Ile-His-Ile-Gly-Pro-Gly-Arg-Ala-Phe-Tyr-Thr-Thr-Gly-Glu-Ile-Ile-Gly-Asp-Ile-Arg-Gln-Ala-His-Cys-Y-(X)-Z (1b.1a)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Lys-Ser-Ile-Tyr-Ile-Gly-Pro-Gly-Arg-Ala-Phe-His-Thr-Thr-Gly-Arg-Ile-Ile-Gly-Y-(X)-Z (1b.2)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Thr-Arg-Ser-Ile-His-Ile-Gly-Pro-Gly-Arg-Ala-Phe-Tyr-Ala-Thr-Gly-Asp-Ile-Ile-Gly-Y-(X)-Z (1b.3)

(A)-(B)-(X)-Y-Tyr-Asn-Lys-Arg-Lys-Arg-Ile-His-Ile-Gly-Pro-Gly-Arg-Ala-Phe-Tyr-Thr-Thr-Lys-Asn-Ile-Ile-Gly-Y-(X)-Z (1b.4)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Lys-Ser-Ile-Thr-Lys-Gly-Pro-Gly-Arg-Val-Ile-Tyr-Ala-Thr-Gly-Gln-Ile-Ile-Gly-Y-(X)-Z (1b.5)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Arg-Gly-Ile-His-Phe-Gly-Pro-Gly-Gln-Ala-Leu-Tyr-Thr-Thr-Gly-Ile-Val-Gly-Y-(X)-Z (1b.6)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Lys-Ser-Ile-Arg-Ile-Gln-Arg-Gly-Pro-Gly-Arg-Ala-Phe-Val-Thr-Ile-Gly-Lys-Ile-Gly-Y-(X)-Z (1b.7)

(A)-(B)-(X)-Y-Gln-Asn-Thr-Arg-Gln-Arg-Thr-Pro-Ile-Gly-Leu-Gly-Gln-Ser-Leu-Tyr-Thr-Thr-Arg-Ser-Arg-Ser-Y-(X)-Z (1b.8)

(A)-(B)-(X)-Y-Gln-Ile-Asp-Ile-Gln-Glu-Met-Arg-Ile-Gly-Pro-Met-Ala-Trp-Tyr-Ser-Met-Gly-Ile-Gly-Gly-Y-(X)-Z (1b.9)

(A)-(B)-(X)-Y-Asn-Asn-Thr-Arg-Arg-Gly-Ile-His-Met-Gly-Trp-Gly-
Arg-Thr-Phe-Tyr-Ala-Thr-Gly-Glu-Ile-Ile-Gly-Y-(X)-Z (1b.10)

(A)-(B)-(X)-Y-Arg-Asp-Asn-Trp-Arg-Ser-Glu-Leu-Tyr-Lys-Tyr-Lys-Val-Val-Lys-Ile-Glu-Pro-Leu-Gly-Val-Ala-Pro-Thr-Lys-Ala-Lys-Arg-Arg-Val-Val-Gln-Arg-Glu-Lys-Arg-Y-(X)-Z (1b.11)

(A)-(B)-(X)-Y-Ser-Trp-Gly-Cys-Ala-Phe-Arg-Gln-Val-Cys-Y-(X)-Z (2a)

(A)-(B)-(X)-Y-Lys-Tyr-Leu-Gln-Asp-Gln-Ala-Arg-Leu-Asn-Ser-Trp-Gly-Cys-Ala-Phe-Arg-Gln-Val-Cys-Y-(X)-Z (2b)

(A)-(B)-(X)-Y-Asn-Lys-Thr-Val-Leu-Pro-Ile-Thr-Phe-Met-Ser-Gly-Phe-Lys-Phe-His-Ser-Gln-Pro-Val-Ile-Asn-Lys-Y-(X)-Z (2c)

(A)-(B)-(X)-Y-Asn-Lys-Thr-Val-Val-Pro-Ile-Thr-Leu-Met-Ser-Gly-Leu-Val-Phe-His-Ser-Gln-Pro-Ile-Asn-Lys-Y-(X)-Z (2d)

(A)-(B)-(X)-Y-Asn-Lys-Thr-Val-Leu-Pro-Val-Thr-Ile-Met-Ser-Gly-Leu-Val-Phe-His-Ser-Gln-Pro-Ile-Asn-Asp-Y-(X)-Z (2e)

(A)-(B)-(X)-Y-Leu-Trp-Gly-Cys-Ser-Gly-Lys-Ala-Val-Cys-Y-(X)-Z (3a)

(A)-(B)-(X)-Y-Ser-Trp-Gly-Cys-Ala-Trp-Lys-Gln-Val-Cys-Y-(X)-Z. (4a)

(A)-(B)-(X)-Y-Gln-Trp-Gly-Cys-Ser-Trp-Ala-Gln-Val-Cys-Y-(X)-Z (4b)

(A)-(B)-(X)-Y-Val-Leu-Tyr-Ser-Pro-Asn-Val-Ser-Val-Pro-Ser-Ser-Ser-Ser-Thr-Leu-Leu-Tyr-Pro-Ser-Leu-Ala-Y-(X)-Z (I-gp46-3)

(A)-(B)-(X)-Y-Tyr-Thr-Cys-Ile-Val-Cys-Ile-Asp-Arg-Ala-Ser-Leu-Ser-Thr-Trp-His-Val-Leu-Tyr-Ser-Pro-Y-(X)-Z (I-gp46-5)

(A)-(B)-(X)-Y-Asn-Ser-Leu-Ile-Leu-Pro-Pro-Phe-Ser-Leu-Ser-Pro-ValPro-Thr-Leu-Gly-Ser-Arg-Ser-Arg-Arg-Y-(X)-Z (I-gp46-4)

(A)-(B)-(X)-Y-Asp-Ala-Pro-Gly-Tyr-Asp-Pro-Ile-Trp-Phe-Leu-Asn-Thr-Glu-Pro-Ser-Gln-Leu-Pro-Pro-Thr-Ala-Pro-Pro-Leu-Leu-Pro-His-Ser-Asn-Leu-Asp-His-Ile-Leu-Glu-Y-(X)-Z (I-gp46-6)

(A)-(B)-(X)-Y-Gln-Tyr-Ala-Ala-Gln-Asn-Arg-Arg-Gly-Leu-Asp-Leu-Leu-Phe-Trp-Glu-Gln-Gly-Gly-Leu-Cys-Lys-Ala-Leu-Gln-Glu-Gln-Cys-Arg-Phe-Pro-Y-(X)-Z (I-p21-2)

(A)-(B)-(X)-Y-Pro-Pro-Pro-Pro-Ser-Ser-Pro-Thr-His-Asp-Pro-Pro-Asp-Ser-Asp-Pro-Gln-Ile-Pro-Pro-Pro-Tyr-Val-Glu-Pro-Thr-Ala-Pro-Gln-Val-Leu-Y-(X)-Z (I-p19)

(A)-(B)-(X)-Y-Lys-Lys-Pro-Asn-Arg-Gln-Gly-Leu-Gly-Tyr-Tyr-Ser-Pro-Ser-Tyr-Asn-Asp-Pro-Y-(X)-Z (II-gp52-1)

(A)-(B)-(X)-Y-Asp-Ala-Pro-Gly-Tyr-Asp-Pro-Leu-Trp-Phe-Ile-Thr-Ser-Glu-Pro-Thr-Gln-Pro-Pro-Pro-Thr-Ser-Pro-Pro-Leu-Val-His-Asp-Ser-Asp-Leu-Glu-His-Val-Leu-Thr-Y-(X)-Z (II-gp52-2)

(A)-(B)-(X)-Y-Tyr-Ser-Cys-Met-Val-Cys-Val-Asp-Arg-Ser-Ser-Leu-Ser-Ser-Trp-His-Val-Leu-Tyr-Thr-Pro-Asn-Ile-Ser-Ile-Pro-Gln-Gln-Thr-Ser-Ser-Arg-Thr-Ile-Leu-Phe-Pro-Ser-Y-(X)-Z (II-gp52-3)

(A)-(B)-(X)-Y-Pro-Thr-Thr-Thr-Pro-Pro-Pro-Pro-Pro-Pro-Pro-Pro-Ser-Pro-Glu-Ala-His-Val-Pro-Pro-Pro-Tyr-Val-Glu-Pro-Thr-Thr-Thr-Gln-Cys-Phe-Y-(X)-Z (II-p19)

(A)-(B)-(X)-Y-Met-Ser-Thr-Ile-Pro-Lys-Pro-Gln-Arg-Lys-Thr-Lys-Arg-Asn-Thr-Asn-Arg-Arg-Pro-Gln-Y-(X)-Z (I)

(A)-(B)-(X)-Y-Pro-Gln-Arg-Lys-Thr-Lys-Arg-Asn-Thr-Asn-Arg-Arg-Pro-Gln-Asp-Val-Lys-Phe-Pro-Gly-Y-(X)-Z (II)

(A)-(B)-(X)-Y-Gln-Arg-Lys-Thr-Lys-Arg-Asn-Thr-Asn-Arg-Arg-Y-(X)-Z. (IIa)

(A)-(B)-(X)-Y-Arg-Asn-Thr-Asn-Arg-Arg-Pro-Gln-Asp-Val-Lys-Phe-Pro-Gly-Gly-Gly-Gln-Ile-Val-Gly-Y-(X)-Z (III)

(A)-(B)-(X)-Y-Leu-Pro-Arg-Arg-Gly-Pro-Arg-Leu-Gly-Val-Arg-Ala-Thr-Arg-Lys-Thr-Ser-Glu-Arg-Ser-Y-(X)-Z (IV)

(A)-(B)-(X)-Y-Val-Gly-Gly-Val-Tyr-Leu-Leu-Pro-Arg-Arg-Gly-Pro-Arg-Leu-Gly-Val-Arg-Ala-Thr-Arg-Y-(X)-Z (IVa)

(A)-(B)-(X)-Y-Thr-Arg-Lys-Thr-Ser-Glu-Arg-Ser-Gln-Pro-Arg-Gly-Arg-Arg-Gln-Pro-Ile-Pro-Lys-Val-Y-(X)-Z (V)

(A)-(B)-(X)-Y-Arg-Ser-Gln-Pro-Arg-Gly-Arg-Arg-Gln-Pro-Ile-Pro-Lys-Val-Arg-Arg-Pro-Glu-Gly-Arg-Y-(X)-Z (Va)

(A)-(B)-(X)-Y-Arg-Arg-Gln-Pro-Ile-Pro-Lys-Val-Arg-Arg-Pro-Glu-Gly-Arg-Thr-Trp-Ala-Gln-Pro-Gly-Y-(X)-Z (VI)

(A)-(B)-(X)-Y-Gly-Arg-Thr-Trp-Ala-Gln-Pro-Gly-Tyr-Pro-Trp-Pro-Leu-Tyr-Gly-Asn-Glu-Gly-Cys-Gly-Y-(X)-Z (VII)

(A)-(B)-(X)-Y-Met-Ser-Thr-Ile-Pro-Gln-Arg-Lys-Thr-Lys-Arg-Asn-Thr-Asn-Arg-Arg-Pro-Gln-Asp-Val-Lys-Phe-Pro-Gly-Gly-Gly-Gln-Ile-Val-Gly-Y-(X)-Z (core 123)

(A)-(B)-(X)-Y-Gly-Gly-Val-Tyr-Leu-Leu-Pro-Arg-Arg-Gly-Pro-Arg-Leu-Gly-Val-Arg-Arg-Ala-Thr-Arg-Lys-Thr-Ser-Glu-Arg-Ser-Gln-Pro-Arg-Gly-Arg-Arg-Gln-Pro-Ile-Pro-Lys-Val-Arg-Arg-Y-(X)-Z (core 7910)

(A)-(B)-(X)-Y-Leu-Ser-Gly-Lys-Pro-Ala-Ile-Ile-Pro-Asp-Arg-Glu-Val-Leu-Tyr-Arg-Glu-Phe-Asp-Glu-Y-(X)-Z (VIII)

(A)-(B)-(X)-Y-Ile-Ile-Pro-Asp-Arg-Glu-Val-Leu-Tyr-Arg-Glu-Phe-Asp-Glu-Met-Glu-Glu-Cys-Ser-Gln-Y-(X)-Z (IX)

(A)-(B)-(X)-Y-Val-Leu-Tyr-Arg-Glu-Phe-Asp-Glu-Met-Glu-Glu-Cys-Ser-Gln-His-Leu-Pro-Tyr-Ile-Glu-Y-(X)-Z (HCV3)

(A)-(B)-(X)-Y-Asp-Glu-Met-Glu-Glu-Cys-Ser-Gln-His-Leu-Pro-Tyr-Ile-Glu-Gln-Gly-Met-Met-Leu-Ala-Y-(X)-Z (X)

(A)-(B)-(X)-Y-Ser-Gln-His-Leu-Pro-Tyr-Ile-Glu-Gln-Gly-Met-Met-Leu-Ala-Glu-Gln-Phe-Lys-Gln-Lys-Y-(X)-Z (XI)

(A)-(B)-(X)-Y-Ile-Glu-Gln-Gly-Met-Met-Leu-Ala-Glu-Gln-Phe-Lys-Gln-Lys-Ala-Leu-Gly-Leu-Leu-Gln-Y-(X)-Z

(XII)

(A)-(B)-(X)-Y-Leu-Ala-Glu-Gln-Phe-Lys-Gln-Lys-Ala-Leu-Gly-Leu-Leu-Gln-Thr-Ala-Ser-Arg-Gln-Ala-Y-(X)-Z (XIII)

(A)-(B)-(X)-Y-Gln-Lys-Ala-Leu-Gly-Leu-Leu-Gln-Thr-Ala-Ser-Arg-Gln-Ala-Glu-Val-Ile-Ala-Pro-Ala-Y-(X)-Z
(XIV)

(A)-(B)-(X)-Y-Ser-Gen-His-Leu-Pro-Tyr-Ile-Glu-Gln-Glu-Met-Leu-Ala-Glu-Gen-Phe-Lys-Gln-Lys-Ala-Leu-Gly-Leu-Leu-Gln-Thr-Ala-Ser-Arg-Gln-Ala-Y-(X)-Z
(NS4-27)

(A)-(B)-(X)-Y-Gly-Glu-Gly-Ala-Val-Gln-Trp-Met-Asn-Arg-Leu-Ile-Ala-Phe-Ala-Ser-Arg-Gly-Asn-His-Y-(X)-Z
(NS4-e)

(A)-(B)-(X)-Y-Glu-Asp-Glu-Arg-Glu-Ile-Ser-Val-Pro-Ala-Glu-Ile-Leu-Arg-Lys-Ser-Arg-Arg-Phe-Ala-Y-(X)-Z
(XV)

(A)-(B)-(X)-Y-Leu-Arg-Lys-Ser-Arg-Arg-Phe-Ala-Gln-Ala-Leu-Pro-Val-Trp-Ala-Arg-Pro-Asp-Tyr-Asn-Y-(X)-Z
(XVI)

(A)-(B)-(X)-Y-Val-Trp-Ala-Arg-Pro-Asp-Tyr-Asn-Pro-Pro-Leu-Val-Glu-Thr-Trp-Lys-Lys-Pro-Asp-Tyr-Y-(X)-Z
(XVII)

(A)-(B)-(X)-Y-Glu-Thr-Trp-Lys-Lys-Pro-Asp-Tyr-Glu-Pro-Pro-Val-Val-His-Gly-Cys-Pro-Leu-Pro-Pro-Y-(X)-Z
(XVIII)

(A)-(B)-(X)-Y-Val-His-Gly-Cys-Pro-Leu-Pro-Pro-Pro-Lys-Ser-Pro-Pro-Val-Pro-Pro-Pro-Arg-Lys-Lys-Y-(X)-Z
(XIX)

(A)-(B)-(X)-Y-Glu-Asp-Glu-Arg-Glu-Ile-Ser-Val-Pro-Ala-Glu-Ile-Leu-Arg-Lys-Ser-Arg-Lys-Ser-Arg-Arg-Phe-Ala-Gln-Ala-Leu-Pro-Val-Trp-Ala-Arg-Pro-Asp-Tyr-Asp-Tyr-Asn-Y-(X)-Z(NS5-2527)

(A)-(B)-(X)-Y-Gly-Glu-Thr-Tyr-Thr-Ser-Gly-Gly-Ala-Ala-Ser-His-Thr-Thr-Ser-Thr-Leu-Ala-Ser-Leu-Phe-Ser-Pro-Gly-Ala-Ser-Gln-Arg-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXa)

(A)-(B)-(X)-Y-Gly-Glu-Thr-Tyr-Thr-Ser-Gly-Gly-Ala-Ala-Ser-His-Thr-Thr-Ser-Thr-Leu-Ala-Ser-Leu-Phe-Ser-Y-(X)-Z
(XXa-1)

(A)-(B)-(X)-Y-Ser-His-Thr-Thr-Ser-Thr-Leu-Ala-Ser-Leu-

Phe-Ser-Pro-Gly-Ala-Ser-Gln-Arg-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXa-2)

(A)-(B)-(X)-Y-Gly-His-Thr-Arg-Val-Ser-Gly-Gly-Ala-Ala-Ala-Ser-Asp-Thr-Arg-Gly-Leu-Val-Ser-Leu-Phe-Ser-Pro-Gly-Ser-Ala-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXb)

(A)-(B)-(X)-Y-Gly-His-Thr-Arg-Val-Ser-Gly-Gly-Ala-Ala-Ala-Ser-Asp-Thr-Arg-Gly-Leu-Val-Ser-Leu-Phe-Ser-Y-(X)-Z
(XXb-1)

(A)-(B)-(X)-Y-Ala-Ser-Asp-Thr-Arg-Gly-Leu-Val-Ser-Leu-Phe-Ser-Pro-Gly-Ser-Ala-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXb-2)

(A)-(B)-(X)-Y-Gly-His-Thr-Arg-Val-Thr-Gly-Gly-Val-Gln-Gly-His-Val-Thr-Cys-Thr-Leu-Thr-Ser-Leu-Phe-Arg-Pro-Gly-Ala-Ser-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXc)

(A)-(B)-(X)-Y-Gly-His-Thr-Arg-Val-Thr-Gly-Gly-Val-Gln-Gly-His-Val-Thr-Cys-Thr-Leu-Thr-Ser-Leu-Phe-Arg-Y-(X)-Z
(XXc-1)

(A)-(B)-(X)-Y-Gly-His-Val-Thr-Cys-Thr-Leu-Thr-Ser-Leu-Phe-Arg-Pro-Gly-Ala-Ser-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXc-2)

(A)-(B)-(X)-Y-Gly-His-Thr-His-Val-Thr-Gly-Gly-Arg-Val-Ala-Ser-Ser-Thr-Gln-Ser-Leu-Val-Ser-Trp-Leu-Ser-Gln-Gly-Pro-Ser-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXd)

(A)-(B)-(X)-Y-Gly-His-Thr-His-Val-Thr-Gly-Gly-Arg-Val-Ala-Ser-Ser-Thr-Gln-Ser-Leu-Val-Ser-Trp-Leu-Ser-Y-(X)-Z
(XXd-1)

(A)-(B)-(X)-Y-Ala-Ser-Ser-Thr-Gln-Ser-Leu-Val-Ser-Trp-Leu-Ser-Gln-Gly-Pro-Ser-Gln-Lys-Ile-Gln-Leu-Val-Asn-Thr-Y-(X)-Z
(XXd-2)

(A)-(B)-(X)-Y-Gly-Asp-Thr-His-Val-Thr-Gly-Gly-Ala-Gln-Ala-Lys-Thr-Thr-Asn-Arg-Leu-Val-Ser-Met-Phe-Ala-Ser-Gly-Pro-Ser-Gln-Lys-Ile-Gln-Leu-Ile-Asn-Thr-Y-(X)-Z
(XXe)

(A)-(B)-(X)-Y-Gly-Asp-Thr-His-Val-Thr-Gly-Gly-Ala-

Gln-Ala-Lys-Thr-Thr-Asn-Arg-Leu-Val-Ser-Met-Phe-Ala
-Y-(X)-Z
(XXe-1)

(A)-(B)-(X)-Y-Ala-Lys-Thr-Thr-Asn-Arg-Leu-Val-Ser-
Met-Phe-Ala-Ser-Gly-Pro-Ser-Gln-Lys-Ile-Gln-Leu-Ile-
Asn-Thr-Y-(X)-Z
(XXe-2)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Tyr-Thr-Ser-Gly-Gly-Asn-
Ala-Gly-His-Thr-Met-Thr-Gly-Ile-Val-Arg-Phe-Phe-Ala-
Pro-Gly-Pro-Lys-Gln-Asn-Val-His-Leu-Ile-Asn-Thr-Y-(X)-Z
(XXf)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Tyr-Thr-Ser-Gly-Gly-Asn-Ala-
Gly-His-Thr-Met-Thr-Gly-Ile-Val-Arg-Phe-Phe-Ala-Y-(X)-Z
(XXf-1)

(A)-(B)-(X)-Y-Gly-His-Thr-Met-Thr-Gly-Ile-Val-Arg-Phe-
Phe-Ala-Pro-Gly-Pro-Lys-Gln-Asn-Val-His-Leu-Ile-Asn-
Thr-Y-(X)-Z
(XXf-2)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Ile-Val-Ser-Gly-Gly-Gln-Ala-
Ala-Arg-Ala-Met-Ser-Gly-Leu-Val-Ser-Leu-Phe-Thr-Pro-
Gly-Ala-Lys-Gln-Asn-Ile-Gln-Leu-Ile-Asn-Thr-Y-(X)-Z
(XXg)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Ile-Val-Ser-Gly-Gly-Gln-Ala-
Ala-Arg-Ala-Met-Ser-Gly-Leu-Val-Ser-Leu-Phe-Thr-Y-(X)-Z
(XXg-1)

(A)-(B)-(X)-Y-Ala-Arg-Ala-Met-Ser-Gly-Leu-Val-Ser-Leu-
Phe-Thr-Pro-Gly-Ala-Lys-Gln-Asn-Ile-Gln-Leu-Ile-Asn-
Thr-Y-(X)-Z
(XXg-2)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Tyr-Thr-Thr-Gly-Gly-Ser-Thr-
Ala-Arg-Thr-Thr-Gln-Gly-Leu-Val-Ser-Leu-Phe-Ser-Arg-
Gly-Ala-Lys-Gln-Asp-Ile-Gln-Leu-Ile-Asn-Thr-Y-(X)-Z
(XXh)

(A)-(B)-(X)-Y-Ala-Glu-Thr-Tyr-Thr-Thr-Gly-Gly-Ser-Thr-
Ala-Arg-Thr-Thr-Gln-Gly-Leu-Val-Ser-Leu-Phe-Ser-Y-(X)-Z
(XXh-1)

(A)-(B)-(X)-Y-Ala-Arg-Thr-Thr-Gln-Gly-Leu-Val-Ser-Leu-
Phe-Ser-Arg-Gly-Ala-Lys-Gln-Asp-Ile-Gln-Leu-Ile-Asn-
Thr-Y-(X)-Z
(XXh-2)

(A)-(B)-(X)-Y-Ala-Gln-Thr-His-Thr-Val-Gly-Gly-Ser-Thr-
Ala-His-Asn-Ala-Arg-Thr-Leu-Thr-Gly-Met-Phe-Ser-Leu-
Gly-Ala-Arg-Gln-Lys-Ile-Gln-Leu-Ile-Asn-Thr-Y-(X)-Z

(XX/2)

(A)-(B)-(X)-Y-Ala-Gln-Thr-His-Thr-Val-Gly-Gly-Ser-Thr-Ala-His-Asn-Ala-Arg-Thr-Leu-Thr-Gly-Met-Phe-Ser-Y-(X)-Z
(XX/2-1)

(A)-(B)-(X)-Y-Ala-His-Asn-Ala-Arg-Thr-Leu-Thr-Gly-Met-Phe-Ser-Leu-Gly-Ala-Arg-Gln-Lys-Ile-Gln-Leu-Ile-Asn-Thr-Y-(X)-Z
(XX/2-2)

(A)-(B)-(X)-Y-Val-Asn-Gln-Arg-Ala-Val-Val-Ala-Pro-Asp-Lys-Glu-Val-Leu-Tyr-Glu-Ala-Phe-Asp-Glu-Y-(X)-Z
(VIII-2)

(A)-(B)-(X)-Y-Val-Ala-Pro-Asp-Lys-Glu-Val-Leu-Tyr-Glu-Ala-Phe-Asp-Glu-Met-Glu-Glu-Cys-Ala-Ser-Y-(X)-Z
(IX-2)

(A)-(B)-(X)-Y-Asp-Glu-Met-Glu-Glu-Cys-Ala-Ser-Arg-Ala-Ala-Leu-Ile-Glu-Glu-Gly-Gln-Arg-Ile-Ala-Y-(X)-Z
(X-2)

(A)-(B)-(X)-Y-Ala-Ser-Arg-Ala-Ala-Leu-Ile-Glu-Glu-Gly-Gln-Arg-Ile-Ala-Glu-Met-Leu-Lys-Ser-Lys-Y-(X)-Z
(XI-2)

(A)-(B)-(X)-Y-Ile-Glu-Glu-Gly-Gln-Arg-Ile-Ala-Glu-Met-Leu-Lys-Ser-Lys-Ile-Gln-Gly-Leu-Leu-Gln-Y-(X)-Z
(XII-2)

(A)-(B)-(X)-Y-Ile-Ala-Glu-Met-Leu-Lys-Ser-Lys-Ile-Gln-Gly-Leu-Leu-Gln-Gln-Ala-Ser-Lys-Gln-Ala-Y-(X)-Z
(XIII-2)

(A)-(B)-(X)-Y-Ser-Lys-Ile-Gln-Gly-Leu-Leu-Gln-Gln-Ala-Ser-Lys-Gln-Ala-Gln-Asp-Ile-Gln-Pro-Ala-Y-(X)-Z
(XIV-2)

(A)-(B)-(X)-Y-Arg-Ser-Asp-Leu-Glu-Pro-Ser-Ile-Pro-Ser-Glu-Tyr-Met-Leu-Pro-Lys-Lys-Arg-Phe-Pro-(X)-Y-Z
(XV-2)

(A)-(B)-(X)-Y-Met-Leu-Pro-Lys-Lys-Arg-Phe-Pro-Pro-Ala-Leu-Pro-Ala-Trp-Ala-Arg-Pro-Asp-Tyr-Asn-Y-(X)-Z
(XVI-2)

(A)-(B)-(X)-Y-Ala-Trp-Ala-Arg-Pro-Asp-Tyr-Asn-Pro-Pro-Leu-Val-Glu-Ser-Trp-Lys-Arg-Pro-Asp-Tyr-Y-(X)-Z
(XVII-2)

(A)-(B)-(X)-Y-Glu-Ser-Trp-Lys-Arg-Pro-Asp-Tyr-Gln-Pro-Ala-Thr-Val-Ala-Gly-Cys-Ala-Leu-Pro-Pro-Y-(X)-Z
(XVIII-2)

(A)-(B)-(X)-Y-Val-Ala-Gly-Cys-Ala-Leu-Pro-Pro-Pro-Lys-Lys-Thr-Pro-Thr-Pro-Pro-Pro-Arg-Arg-Arg-Y-(X)-Z
(XIX-2)

or hybrid HCV peptide sequences consisting of combinations of the core epitopes of the HCV core (table 9) HCV NS4 (table 10) or the HCV NS5 (table 11) region separated by Gly and/or Ser residues, and preferentially the following hybrid HCV sequences:

(A)-(B)-(X)-Y-Ile-Pro-Asp-Arg-Glu-Val-Leu-Tyr-Arg-Gly-Gly-Lys-Lys-Pro-Asp-Tyr-Glu-Pro-Pro-Val-Gly-Gly-Arg-Arg-Pro-Gln-Asp-Val-Lys-Phe-Pro-Y-(X)-Z
(Epi-152)

(A)-(B)-(X)-Y-Trp-Ala-Arg-Pro-Asp-Tyr-Asn-Pro-Pro-Gly-Gly-Gln-Phe-Lys-Gln-Lys-Ala-Leu-Gly-Leu-Gly-Ser-Gly-Val-Tyr-Leu-Leu-Pro-Arg-Arg-Gly-Y-(X)-Z
(Epi-33B3A)
(A)-(B)-(X)-Y-Arg-Gly-Arg-Arg-Gln-Pro-Ile-Pro-Lys-Gly-Gly-Ser-Gln-His-Leu-Pro-Tyr-Ile-Glu-Gln-Ser-Gly-Pro-Val-Val-His-Gly-Cys-Pro-Leu-Pro-Y-(X)-Z
(Epi-4B2A6);

wherein A, B, X, Y and Z are defined in Claim 3,

or biotinylated synthetic sequences consisting of peptides containing at each position all the amino acids found in the naturally occuring isolates, with said peptides being derived from any of the above-mentioned immunologically important regions (see Figure 14).

5. Peptide composition according to claim 4 consisting of a combination of biotinylated peptides selected from:

A. II, III, IVa, Va, IX, XI, XIII, XV, XVI, XVIII, 1a.3, 1a.4, 1a.b, 1b.1a, 2b, 2d,
B. II, III, IVa, Va, IX, IX-2, XI, XI-2, XIII, XIII-2, XV, XV-2, XVI, XVI-2, XVIII, XVIII-2, 1a.3, 1a.4, 1a.b, 1b.1a, 2b, 2d.

6. Peptide composition according to claim 4 consisting of a combination of biotinylated peptides comprising:

1a.3, 1a.4, 1b.1, 2b, 2c, 2d, I-gp46-3, I-gp46-4, I-gp46-5,
I-gp46-6, II-gp52-2, II-gp52-3, I-p21-2, I-p19, II-p19.

7. Peptide composition according to claim 4 consisting of a combination of biotinylated peptides comprising:

1a.3, 1a.4, 1a.6, 1b.1a, 2d, II, III, IVa, Va, IX, XI, XIII, XV, XVI, XVIII, XXa-2, XXc-2, XXg-2, XXh-2, I-gp46-3,

I-gp46-4, I-gp46-5, I-gp46-6, II-gp52-3, I-p21-2, I-p19, II-p19.

8. Peptide composition according to claim 4 for detecting or immunizing against HCV, comprising a peptide having an amino acid sequence selected from the group of :

A. I, III, IVa, Va,
B. II, III, IVa, Va,
C. IX, XI, XIII,
D. XV, XVI, XVIII, XIX,
E. XXc-2, XXa-1, XXa-2, XXh-1, XXh-2, XXg-2, XX/2-2,
F. IX-2, XI-2, XIII-2,
G. XV-2, XVI-2, XVIII-2, XIX-2,
H. IX, IX-2, XI, XI-2, XIII, XIII-2,
I. XV, XV-2, XVI, XVI-2, XVIII, XVIII-2, XIX, XIX-2,
J. II, III, IVa, Va, IX, IX-2, XI, XI-2, XIII, XIII-2, XV, XV-2, XVI, XVI-2, XVIII, XVIII-2,
K. II, III, IVa, Va, IX, XI, XIII, XV, XVI, XVIII,
L. II, III, IV, V, IX, XI, XIII, XV, XVI, XVIII,
M. II, III, IVa, Va, IX, XI, XIII, XV, XVI, XVIII, XXa-2, XXc-2, XXg-2, XXh-2.
N. Epi-152, Epi-33B3A, Epi-4B2A6

9. Peptide composition according to claim 4 for detecting or immunizing against HIV, comprising a peptide having an amino acid sequence selected from the group of :

for type 1:
A. 1a.3, 1a.4, 1a.5, 1a.b
B. 1a.3, 1a.4, 1b.1, 1b.3, 1b.6, 1b.10,
C. 1b.1, 1b.2, 1b.3, 1b.4, 1b.5, 1b.6, 1b.7, 1b.8, 1b.9, 1b.10
D. 1b.1, 1b.2, 1b.3, 1b.4, 1b.6, 1b.10,
E. 1a.3, 1a.4, 1a.5, 1a.b, 1b.1a.

for type 2:
A. 2b, 2c, 2d, 2e.

for types 1 and 2:
A. 1a.3, 1a.4, 1b.1, 2b, 2c, 2d,
B. 1a.3, 1a.4, 1b.1a, 2b, 2d.

10. Peptide composition according to claim 4 for detecting or immunizing against HTLV, comprising a peptide having an amino acid sequence selected from the group of:

for Human T-Lymphotropic virus I:
Peptides I-gp46-3, I-gp46-4, I-gp46-5, I-gp46-6, I-p21-2, I-p19

for Human T-Lymphotropic virus type II:
peptides II-gp52-1, II-gp52-2, II-gp52-3, I-gp46-4, II-p19, I-p21-2.

for Human lymphotropic virus types I and II:
Peptides I-gp46-3, I-gp46-4, I-gp46-5, I-gp46-6, II-gp52-1, IIgp52-2, II-gp52-3, I-p21-2, I-p19, II-p19.

11. Process for the in vitro determination of antibodies to HCV, and/or HIV, and/or HTLV I or II by using a peptide composition according to any of claims 4 to 10 in an immunoassay procedure, wherein the biotinylated peptides used are in the form of complexes of streptavidin-biotinylated or of avidin-biotinylated peptides.

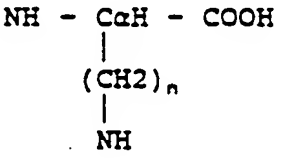
12. Process for the in vitro determination of antibodies to HIV or diagnosis of HIV infection by using a peptide composition according to claims 4, 5, 6, 7 or 9 in an immunoassay procedure, wherein the biotinylated peptides used are in the form of complexes of streptavidin-biotinylated or of avidin-biotinylated peptides.

13. Process for the in vitro determination of antibodies to HCV or diagnosis of HCV infection by using a peptide composition according to claims 4, 5, 6, 7 or 8 in an immunoassay procedure, wherein the biotinylated peptides used are in the form of complexes of streptavidin-biotinylated or of avidin-biotinylated peptides.

14. Process for the in vitro determination of antibodies to HTLV I or II or diagnosis of HTLV I or II infection by using a peptide composition according to claims 4, 5, 6, 7 or 10 in an immunoassay procedure, wherein the biotinylated peptides used are in the form of complexes of streptavidin-biotinylated or of avidin- biotinylated peptides.

15. Use of a peptide composition according to any of claims 4 to 10, for immunisation against HIV, and/or HCV, and/or HTLV I or II infection.

16. Process for obtaining biotinylated peptides according to any of claims 4 to 10 in which N-α-Fmoc-X (N-y-biotin) or N-α-Fmoc-X (N-y-biotin) derivative is used as intermediary product, wherein X represents

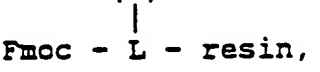


where n is at least 1 but less than 10 and is preferably between 3 and 6, one amino group being attached to the Cα atom while the other being attached to carbon Cy, which is the most distal carbon in the side chain; or their esters obtained with alcohol ROH and more particularly the pentafluorophenyl ester;
- y representing position y with respect to the carbon atom carrying the COOH group in the radical.

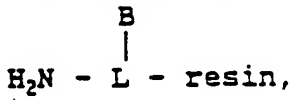
17. Process according to claim 16, wherein N-α-Fmoc-x (N-y-biotin) is N-α-Fmoc-Lys (N-ε-biotin) or N-α-Fmoc-ornithinyl (N-ε-biotin).

18. Process for preparing a carboxy terminal biotinylated peptide, comprising the following steps:

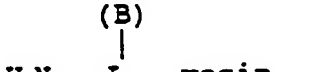
- coupling of a carboxy-activated form of the intermediary product as defined above to a cleavable linker attached to the resin, for instance to obtain the following compound:



- deprotection of the α amino group of the intermediary compound, for instance by means of piperidine to obtain:



- successive addition of the subsequent amino acids AA_1.... AA_n duly protected onto



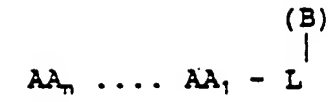
to obtain:

- deprotection of the NH_2-terminal for instance by means of piperidine,

- deprotection of the compound obtained, cleavage from the resin, extraction and purification of the peptide obtained, biotinylated at its carboxy terminal end, the steps of side chain deprotection and cleavage being liable to be performed simultaneously or separately, and particularly deprotection of the NH_2-terminal, for instance by means of piperidine,

- cleavage from the resin for instance with trifluoroacetic acid, in the presence of scavengers such as ethanedithiol, or thioanisole, or anisole, - extraction of the peptide with a solvent such as diethylether to remove most of the acid and scavengers,

- purification, such as with HPLC to obtain:

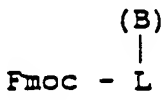


19. Process for preparing a N-terminal biotinylated peptide, comprising the following steps:

- addition of the subsequent amino acids duly protected onto the resin to give:
  Fmoc - AA_1 ..... AA_n - resin,

- deprotection of the NH_2-terminal for instance by means of piperidine,

- addition of the intermediary product:



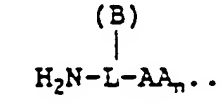
through its COOH onto the NH_2-terminal to obtain:

- deprotection of the NH_2 terminal group of the compound obtained, cleavage from the resin, extraction and purification of the peptide obtained, biotinylated at its amino terminal, the steps of side chain deprotection and cleavage being liable to be performed simultaneously or separately, and particularly deprotection of the NH-terminal group of the intermediary group, for instance by means of piperidine,

- cleavage from the resin for instance with an acid such as trifluoroacetic acid, in the presence of scavengers such as ethanedithiol, thioanisole, or anisole,

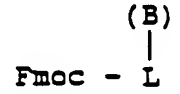
- extraction of the peptide with a solvent such as diethylether to remove most the acid and scavengers,

- purification, such as with HPLC to obtain:

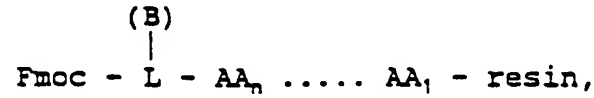


20. Process for preparing an internally biotinylated peptide, comprising the following steps:

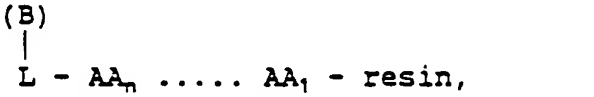
- addition of successive amino acids duly protected onto the resin to give: Fmoc - AA_n ..... AA_1 - resin,
- deprotection of the NH_2-terminal,
- addition of the intermediary product:



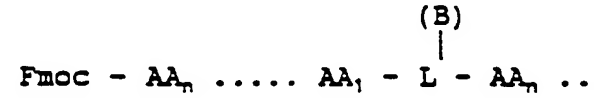
through its COOH onto the NH_2-terminal to obtain:



- deprotection of the α amino group of the intermediary compound, for instance by means of piperidine to obtain:



- addition of the subsequent amino acids duly protected onto the resin to give:

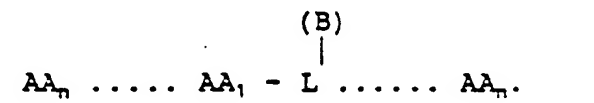


- deprotection of the NH_2 terminal group of the compound obtained, cleavage from the resin, extraction and purification of the peptide obtained, biotinylated at its amino-terminal, the steps of side chain deprotection and cleavage being liable to be performed simultaneously or separately, and particularly, deprotection of the NH_2 terminal group of the peptide, for instance by means of piperidine

- cleavage from the resin for instance with trifluoroacetic acid, in the presence of scavengers such as ethanedithiol, or thioanisole, or anisole,

- extraction of the peptide with a solvent such as diethylether to remove most of the acid and scavengers,

- purification, such as with HPLC to obtain:



21 - Compound of formula:
N-α-Fmoc-X (N-γ-biotin)

or N-α-Fmoc-X (N-y-biotin),

wherein X represents NH - CαH - COOH
|
(CH2)n
|
NH

where n is at least 1 but less than 10 and is preferably between 3 and 6, one amino group being attached to the Cα atom while the other being attached to carbon Cy, which is the most distal carbon in the side chain; or their esters obtained with alcohol ROH and particularly the pentafluorophenyl ester;

- y representing position y with respect to the carbon atom carrying the COOH group in the radical.

22. Process for preparing the compound according to claim 21, comprising the following steps:

- reaction of a diamino-, monocarboxylic acid previously described with fluorenylmethysuccinimidylcarbonate or fluorenylmethyl chloroformate under conditions of carefully controlled pH to give the singly protected N-α-Fmoc derivative,

- or alternatively, use of commercially available N-α-Fmoc-protected diamino-monocarboxylic acids when the side chain amino group is provided with a protecting group which is different from the Fmoc group used to protect the α-amino group, the side chain amino group protection being liable to be selectively removed under conditions which leave the N-α-Fmoc group intact,

- purification of the mono-protected N-α-Fmoc-diamino-monocarboxylic acid derivative by selective extractions and chromatography,
- reaction of the derivative obtained with a carboxy-activated derivative of biotin, such as N-hydroxysuccinimide biotin, to obtain the (N-α-Fmoc)-(N-y-biotin) derivative which is the desired intermediary product,

- purification of the intermediary product by selective extractions, precipitations, or chromatography.